Sept 16/79

My dear Gray

Many thanks for your and Engelmann's letters which have made me reconsider carefully the points upon which you differ from me With the great respect I have for the general accuracy of your views yet I cannot quite give up my own ~~views~~ without a struggle and therefore I must trouble you again with a few observations which before I send I shall show to Hooker who is about returning from a month's holding in Scotland

First as to the term 'lamina ovulifera' which you object to. I admit that it may be rather cumbersome but I am unable to devise a better one My great object was to use one which should not be oppressive of a theoretical homology where that homology is uncertain. The peculiar organ in question exists in the female flower throughout the order, ~~it is found in~~ and therefore must have the same name in all the genera, it is far too diversified in outward form and appearance to give it a name derived from that appearance, its theoretical homology too much disputed to justify any designation founded upon the settlement of that question and consequently endeavoured to select a perfectly neutral name. You propose squama carpellaris or carpel-scale to which you say there can be no objection. Unfortunately I fear I must object to both words. In descriptive botany squama or scale is a very convenient and useful term entirely derived from outward appearance — (a vague resemblance to the scale of a fish) (so are also such terms as gland, wing etc. all founded on outward appearance) Then squama may be indumental (in a lepidote indumentum) or foliar (in the case of a prophyllum or of a bract) or appendicular (when terminating a connective) or a compound organ (in the scales of the cones of Cupressineæ). I think therefore that it is a very good term for the as popularly used for the scales of the cones of such Coniferæ as form cones whether these scales be simple or compound but inapplicable to what I have called lamina ovulifera which only constitutes a part of the scale or is independent of it. Then the word carpellary is entirely theoretical. I cannot

admit
that we "know that it is composed of two leaves of an apellary branch".
That view has been broached by some organogeneists and absolutely denied by others, and I have been unable to see anything to confirm it. At the time of flowering it is sometimes a scarcely prominent ring perfectly entire and uniform all round, more frequently more developed on the outside than on the side next the axis of the amentum, often a flat regular or oblique disk or already forming a scale larger than the subtending bract, very rarely showing a tendency to a prominent lobe on each side and then perhaps owing to outward pressure. That it is apellary and the development of a secondary axis I readily admit, but I think that those who contend that it is foliar or perianthial or discal or carpellary have all more or less of ground for their contention, as all these are in the first instance developments of or excrescences from an axis. In the present case the organ in question is not sufficiently developed to have assumed the form or to perform the functions of either a leaf or a perianth or a pistil and there is nothing to prove what it would be if it were further developed. Its close contiguity to the ovule might justify Brown's supposition that it may be an imperfect open ovary but on the other hand there is nothing to show that it may not be a mere disk or expansion of the torus. I think the latter the more probable but still am not prepared to deny the other and therefore have sought a neutral term.

With regard to the arrangement of the tribes I am sorry that that which I propose should interfere with old traditions which I am always desirous of respecting but in this case I cannot but think that they may be improved upon. Coniferæ have been classed chiefly with respect to their fruits without reference to their flowers, and in the order the female organs change much in their form and relative position in passing from the flower to the fruit, and whenever that is the case I think have always regarded the characters derived from them in the former state of much more importance than the subsequent transformations. Take the three genera Cephalotaxus Torreya and Podocarpus which have been placed in one group on account of the assorted drupaceous fruit common to all three, but the flower and subsequent growth of the fruit is very different. In Cephalotaxus it is a naked seed with a drupaceous testa, the ovuliferous lamina (originally free from the 2 erect ovules) has remained uncalarged and united with the subtending bract. In Torreya the ovuliferous lamina at first a mere ring at the base of the erect ovule has grown up with it and over it at first an adnate cup and at last forming the greater part of the exocarp. In Podocarpus the reversed ovule is as in Abietineæ partly embedded in and continuous with the dilated apex of the ovuliferous lamina, which grows with the seed and forms its outer coating or exocarp, so much so as to have induced some botanists to consider the ovule and lamina as an anatropous ovule alone. I have therefore endeavoured to draw characters more from the ovule than from the relative subsequent development of the ovuliferous lamina and subtending bract. In all orders where the ovules are solitary or few and definite I have found the difference between the inferior and the superior micropyle and radicle of great importance. It is that which distinguishes the two great tribes of Monimiaceæ which some regard as order. it separates Balanops from Euphorbiaceæ, Platanus from Moreæ. And though I believe that the same character may in different cases have a very different value, yet here I cannot but think that the reversed and erect ovule are as in Monimiaceæ of primary importance in the division of the Order and Taxeæ appear to me as near to Taxodieæ and Podocarpeæ to Abietineæ as Taxeæ to Podocarpeæ. That the ovule of Sequoia and of Dacrydium should be sometimes at first nearly horizontal is I think no objection as the tendency of the ovule is very soon and very decidedly downward in the one and upward in the other and all botanical characters however important are liable to show occasional undecided cases.

As to the staminal column of the male flower, though I believe it to consist mainly if not entirely of the united filaments, I will readily admit that it may or may not enclose and be consolidated with a central axis – It is the same in several Euphorbiaceæ for instance with indefinite stamens united in a central solid column – in one genus you can find no evidence of a central axis – in an allied genus you see a rudimentary ovary at the top of the column above the last stamens, and yet every one considers the column as consisting chiefly of the monadelphous filaments.

As to the fruit of Juniperus I have traced it in two species from the flower through various stages to the fruit. In the flower the scales (consisting of the consolidated ovuliferous lamina and bract) are slightly open exposing the normal erect ovule, but close over them immediately after fecundation consolidated into a fleshy mass leaving a small cell round each ovule. ~~When~~ As the fruit ripens the inner layer of the scales hardens into a distinct pyrene round each seed or in J. drupacea into one thick wooden mass in the whole fruit with 1 2 or more cells. The seed remains ~~quite free~~ in the cell quite free from its walls attached by the base only and being so completely enclosed the testa remains thin. Generally in Coniferæ the more exposed the seed is the more its integument appears to harden or thicken, thinnest in Juniperus and Taxodieæ where it is permanently enclosed, thick and drupaceous in Cephalotaxus or very hard in Dacrydium where it is quite exposed.

I fear D Engelmann may not agree in all their views, they are however the result of much study and observation, yet if he can convince me that I am wrong as he did in the case of the Rhododendron juniperinum I shall be ready to recant as upon that occasion.

You will have received my sheets of the new part of our Genera I now send the recruits. The Monochlamydeous Orders have many of them so little connection with each other or even in many cases with any